

No.

9700060

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Pennsylvania Agricultural Experiment Station

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR USING IT IN PRODUCING A HYBRID OR PLANT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. IN THE UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED, AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS SPECIFIED BY THE OWNER OF THE RIGHTS. (34 STAT. 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000)

BENTGRASS, CREEPING

'Penn A-4'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this twenty-second day of November, in the year two thousand and four.

Attest:

R. M. Zick

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Arthur Foreman

Secretary of Agriculture


U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY DIVISION - PLANT VARIETY PROTECTION OFFICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

(Instructions and information collection burden statement on reverse)

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S) (as it is to appear on the Certificate)		2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER	3. VARIETY NAME
Pennsylvania Agricultural Experiment Station		A-4	Penn A-4 Creeping Bentgrass
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)		5. TELEPHONE (include area code)	FOR OFFICIAL USE ONLY PVPO NUMBER 9700060
0217 Agricultural Administration Building The Pennsylvania State University University Park, PA 16802		814-865-5410	
7. GENUS AND SPECIES NAME		6. FAX (include area code)	FILING DATE
Agrostis palustris		814-863-7905	Dec. 19, 1996
8. FAMILY NAME (Botanical)		FILING AND EXAMINATION FEE:	
Gramineae		\$ 2,450. —	
9. CROP KIND NAME (Common name)		DATE	
Creeping Bentgrass		12/19/96	
10. IF THE APPLICANT NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION (corporation, partnership, association, etc.) (Common name)		CERTIFICATION FEE:	
Land Grant University		\$ 432.00	
11. IF INCORPORATED, GIVE STATE OF INCORPORATION		DATE	
		9/20/04	
12. DATE OF INCORPORATION		14. TELEPHONE (include area code)	
13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS		15. FAX (include area code)	
Dr. Charles R. Krueger Associate Dean 0217 Agricultural Administration Building University Park, PA 16802		Bruce McPherson RAO 11/17/04	
16. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions on reverse)			
a. <input checked="" type="checkbox"/> Exhibit A. Origin and Breeding History of the Variety b. <input checked="" type="checkbox"/> Exhibit B. Statement of Distinctness c. <input checked="" type="checkbox"/> Exhibit C. Objective Description of the Variety d. <input checked="" type="checkbox"/> Exhibit D. Additional Description of the Variety (Optional) e. <input checked="" type="checkbox"/> Exhibit E. Statement of the Basis of the Applicant's Ownership f. <input checked="" type="checkbox"/> Voucher Sample (2,500 viable untreated seeds or, for tuber propagated varieties verification that tissue culture will be deposited and maintained in an approved public repository) g. <input checked="" type="checkbox"/> Filing and Examination Fee (\$2,460), made payable to "Treasurer of the United States" (Mail to PVPO)			
17. DOES THE APPLICANT SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY, AS A CLASS OF CERTIFIED SEED? (See Section 83(a) of the Plant Variety Protection Act)			
<input checked="" type="checkbox"/> YES (If "yes," answer items 18 and 19 below) <input type="checkbox"/> NO (If "no," go to item 20)			
18. DOES THE APPLICANT SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?		19. IF "YES" TO ITEM 18, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED?	
<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		<input type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input checked="" type="checkbox"/> CERTIFIED	
20. HAS THE VARIETY OR A HYBRID PRODUCED FROM THE VARIETY BEEN RELEASED, USED, OFFERED FOR SALE, OR MARKETING IN THE U.S. OR OTHER COUNTRIES?			
<input checked="" type="checkbox"/> YES (If "yes," give names of countries and dates) <input type="checkbox"/> NO			
USA, January 24, 1996 Commercial Sale			
21. The applicant(s) declare that a viable sample of basic seed of the variety will be furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate.			
The undersigned applicant(s) is(are) the owner(s) of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act.			
Applicant(s) is(are) informed that false representation herein can jeopardize protection and result in penalties.			
SIGNATURE OF APPLICANT (Owner(s))		SIGNATURE OF APPLICANT (Owner(s))	
			
NAME (Please print or type)		NAME (Please print or type)	
Charles R. Krueger			
CAPACITY OR TITLE	DATE	CAPACITY OR TITLE	DATE
Associate Dean	10/17/96		

INSTRUCTIONS

GENERAL: To be effectively filed with the Plant Variety Protection Office (PVPO), **ALL** of the following items must be received in the PVPO: (1) Completed application form signed by the owner; (2) completed Exhibits A, B, C, E; (3) at least 2,500 viable untreated seeds, or for tuber reproduced varieties verification that a viable (*in the sense that it will reproduce an entire plant*) tissue culture will be deposited and maintained in an approved public repository; (4) check drawn on a U.S. bank for \$2,450 (\$300 filing fee and \$2,150 examination fee), payable to "Treasurer of the United States" (*See Section 97.6 of the Regulations and Rules of Practice.*) Partial applications will be held in the PVPO for not more than 90 days, then returned to the applicant as unfilled. Mail application and other requirements to Plant Variety Protection Office, AMS, USDA, Room 500, NAL Building, 10301 Baltimore Blvd., Beltsville, MD 20705-2351. Retain one copy for your files. All items on the face of the application are self explanatory unless noted below. Corrections on the application form and exhibits must be initialed and dated. **DO NOT** use masking materials to make corrections. If a certificate is allowed, you will be requested to send a check payable to "Treasurer of the United States" in the amount of \$300 for issuance of the Certificate.

Plant Variety Protection Office
Telephone: (301) 504-5518

ITEM

- 16a. Give: (1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method;
- (2) the details of subsequent stages of selection and multiplication;
- (3) evidence of uniformity and stability; and
- (4) the type and frequency of variants during reproduction and multiplication and state how these variants may be identified.
- 16b. Give a summary of the variety's distinctness. Clearly state how this application variety may be distinguished from all other varieties in the same crop. If the new variety is most similar to one variety or a group of related varieties:
- (1) identify these varieties and state all differences objectively;
- (2) attach statistical data for characters expressed numerically and demonstrate that these are clear differences;
- (3) submit, if helpful, seed and plant specimens or photographs (prints) of seed and plant comparisons which clearly indicate distinctness.
- 16c. Exhibit C forms are available from the PVPO for most crops; specify crop kind. Fill in Exhibit C (Objective Description of Variety) form as completely as possible to describe your variety.
- 16d. Optional additional characteristics and/or photographs. Describe any additional characteristics that cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the characteristics that are difficult to describe, such as plant habit, plant color, disease resistance, etc.
- 16e. Section 52(5) of the Act requires applicants to furnish a statement of the basis of the applicant's ownership. An Exhibit E form is available from the PVPO.
17. If "Yes" is specified (*seed of this variety be sold by variety name only, as a class of certified seed*), the applicant may **NOT** reverse this affirmative decision after the variety has been sold and so labelled, the decision published, or the certificate issued. However, if "No" has been specified, the applicant may change the choice. (*See Regulations and Rules of Practice, Section 97.103.*)
20. See Sections 41, 42, and 43 of the Act and Section 97.5 of the regulations for eligibility requirements.

NOTES: It is the responsibility of the applicant/owner to keep the PVPO informed of any changes of address or change of ownership or assignment during the life of the application/certificate. There is no charge for filing a change of address. The fee for filing a change of ownership or assignment is specified in Section 97.175 of the regulations. (*See Section 101 of the Act, and Sections 97.130, 97.131, 97.175(h) of Regulations and Rules of Practice.*)

To avoid conflict with other variety names in use, the applicant should check the variety names proposed by contacting: Seed Branch, AMS, USDA, Room 213, Building 306, Beltsville Agricultural Research Center--East, Beltsville, MD 20705.
Telephone: (301) 504-8089.

Public reporting burden for this collection of information is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Agriculture, Clearance Officer, OIRM, AG Box 7630, Jamie L. Whitten Building, Washington, D.C. 20250. When replying, refer to OMB No. 0581-0055 and form number in your letter. Under the PRA of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

The U.S. Department of Agriculture (USDA) prohibits discrimination in its programs on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, and marital or familial status. (Not all prohibited bases apply to all programs). Persons with disabilities who require alternative means for communication of program information (braille, large print, audiotape, etc.) should contact the USDA Office of Communications at (202) 720-2791. To file a complaint, write the Secretary of Agriculture, U.S. Department of Agriculture, Washington, D.C. 20250, or call (202) 720-7327 (voice) or (202) 720-1127 (TDD). USDA is an equal employment opportunity employer.

Attachment for Application Item 20.

	PSU Release ¹	PSU PVP Application ²	PVP Application Date ³	First Commercial Sale
Penn A-1	08-29-95	10-17-96	11-26-96	11-30-95
Penn A-2	08-29-95	10-17-96	12-19-96	02-27-96
Penn A-4	08-29-95	10-17-96	12-19-96	01-24-96
Penn G-1	08-29-95	02-21-97	02-26-97	05-20-96
Penn G-2	08-29-95	10-17-96	12-12-96	01-10-96
Penn G-6	08-29-95	10-17-96	01-02-97	01-24-96
Seaside II	08-29-95	10-17-96	12-12-96	01-26-96

¹PSU Release - Date Pennsylvania Experiment Station Seed Committee approved variety release

²PSU PVP Application - Date on PSU PVP application form

³PVP Application - Application date of variety by PVP office as listed in PVP Official Journal,
Vol. 25, December 1997

Penn A-4

Origin and Breeding History of Penn A-1, A-2, A-4, G-1, G-2, G-6

The objective of this varietal breeding program was to develop creeping bentgrasses exhibiting superior putting green turf over existing varieties. Original parental material was selected from segregated patches of bent, 12 to 18 inches in diameter, on some greens at the Augusta National Golf Club, Augusta, Georgia in the spring of 1984. These segregates attracted attention because they were vigorous and dense, very fine textured, and had a more upright growth habit of individual plant tillers. The growth habit was unique because the selected segregates did not spike (raise up) from golfer's metal-spiked golf shoes. Their ability to spread at a closer than normal height of cut used for fast greens was also indicative of potential heat tolerance in a hot, humid golf course environment. The value of non-spikeing features was proven in subsequent years by the banning of golf shoes with metal spikes on most American golf courses, except for professional tournaments.

There were two groups of selections by the breeder, the 'G' and 'A' series. There were eight 'G' selections (G-1 to G-8) from two greens on the Par 3 course originally seeded to Penneagle creeping bent, and six selections (A-1 to A-6) from four greens on the main course originally seeded to Penncross creeping bent.

The breeding method used was a polycross procedure. The single parent selection of Penn A-4 was crossed with experimental selections of Penn G followed by two generations of crossing selected sib plants of Penn A-4.

Both 'G' and 'A' series selections were cloned into eight plants, pot planted, and induced to flower in growth chambers for six weeks. Isolated crossing blocks were established in the greenhouse for each 'G' and 'A' line in December 1984. Due to near self-sterility of bent, 'A' line plants were used as male crossing parents for 'G' lines, and conversely, 'G' plants used as male parents for the 'A' lines. Seed was produced from all crosses in March. Next 250 plants from bulk seed of each 14 lines (G-1, G-2, G-3, G-4, G-5, G-6, G-7, G-8 and A-1, A-2, A-3, A-4, A-5, and A-6) were nursery space planted in isolated field blocks in August 1985.

The first cycle of reselection began in the spring of 1986. First plants to be chemically rogued were those lacking in vigor coming out of winter. Majority of plants had a more upright growth with short stolons in keeping with their putting green selections. There were a few semi-decumbent types with longer stolons and dense ball types. The emphasis was on selecting the most uniform in upright growth habit, vigor, and uniformity in pre-anthesis flowering. On this basis, 30 to 50 plants were selected from each block of A-1, A-2, A-4, G-1, G-2, and G-6. All other 'A' and 'G' lines were discarded due to a combination of segregation and lack of vigor uniformity.

Seed was harvested from selected lines (G-1, G-2, G-6, A-1, A-2, and A-4) and used for small turf plots which confirmed the fine, dense qualities of original parents. The

selected clones of the first cycle were pot planted, cloned, and again induced to flower in growth chambers to save a year. Plants of each line were in isolated greenhouse crossing blocks. Crossing in this cycle was confined to the siblings of each line with no other pollen source. From the crossed plants of each line, 300 seedlings were grown for field planting for the next cycle of reselection in 1987.

The second cycle of reselection in 1987 consisted of arbitrarily selecting 40 to 50 plants as a reasonable number to work with and with the main criterion of selecting an upright growth habit eliminating all but very short stolon types, uniformity of size and vigor, and flowering. Confining the pollen source in this crossing within the A-4 parents resulted in increasing the population of desired growth habit types and reducing the longer stolon types to a few. Most of the "off-types" were limited to the dense ball types with few flowering heads.

Forty clones of each G and A were recloned to three plants and sent to Oregon for further evaluation and reselection under production state conditions where growth is more robust than in Pennsylvania and where commercial production would eventually take place. Following observations, 20 clones each were selected as potential Breeders parents. Seed of each G and A line was used to plant half acre observation, seed yields, and management trials. Satisfactory uniformity and stability of the G and A bent varieties from Oregon grown first generation seed was ascertained by inspection in both the vegetative and flowering stages of growth by the breeder, pure seed testing personnel, and Oregon certification. Variants consisted of a few more spreading decumbent types and the non-spreading ball types. The decumbent type seed heads protrude laterally at plant perimeters and the ball types produce few or no flowers. The decumbent variants for A-4 were calculated to constitute 0.14% based on 40 plants per half acre of an estimated population of 39,000 plants.

By agreement with the Bentgrass Growers Association with proprietary rights, all observed variants shall be chemically rogued to maintain varietal purity and stability in order to maintain a certified stand life of five seed yield years. To further maintain varietal purity, the commercial production of Penn G and A bents shall be limited to a two generation system, Breeder and Certified; the only varieties limited to only two generations.

Three cycles of five year stands of commercial plantings have shown that Penn A-4 is a uniform and stable variety to the satisfaction of the breeder and Oregon Certification with no further reselection deemed necessary.

Breeder seeds of Penn A-4 has been maintained and produced by Pure Seed Testing in Hubbard Oregon since 1994. Approval of the variety name has been cleared by the Seed Branch on May 21, 2003.

Variety Distinction of Penn A-4

A PVP nursery was established at University Park, Pennsylvania in 1994 consisting of 21 creeping bent varieties with three replications of 25 spaced plants. Included were Penn A-4, plus six new Penn State varietal releases Penn G-1, G-2, G-6, A-1, A-2, Seaside II, and 13 commercial varieties. Data were collected in 1995 as shown in Table 1. This nursery was discarded due to loss of land.

A second PVP nursery was established at the Pure Seed Testing Research Farm near Hubbard, Oregon in 1995. The purpose was to evaluate plants in the location of major bentgrass commercial production where growth greatly exceeds the environment in the Northeast. It consisted of the above experimentals and 12 commercial varieties with four replications of 25 spaced plants. This test was maintained and data collected and analyzed by Pure Seed personnel after the original application for PVP. These data are shown in Tables 2 and 3. Varieties significantly different by years from Penn A-4 are summarized in Table 4. In this form, the most obvious differences and similarities are easily discerned.

Penn A-4 may be most easily distinguished from other bentgrass varieties tested predominately by plant height, panicle length, and number of lower whorl branches based on three years of testing. It is most similar to Pennlinks. Differences appear to be the following:

<u>Characteristic</u>	<u>Penn A-4</u>	<u>vs</u>	<u>Pennlinks</u>
Growth habit	Geniculate		Decumbent
Ligule pubescence	Pubescent		Glabrous
Basal hair number	Absent		Few

U.S. Department of Agriculture
Agricultural Marketing Service
Science Division
Beltsville, Maryland 20705

OBJECTIVE DESCRIPTION OF VARIETY
BENTGRASS (Agrostis spp.)

Name of Applicant(s) Pennsylvania Agricultural Experiment Station	Variety Name or Temporary Designation Penn A-4 (A-4)
Address (Street and No. or R.F.D. No, City, & ZIP Code) 0217 Agricultural Administration Bldg. The Pennsylvania State University University Park, PA 16802	FOR OFFICIAL USE ONLY PVPO Number

Place numbers in the boxes (e.g.) for the characters that best describe typical plants of this variety. The symbol Δ indicates decimal.

COMPARISON VARIETIES FOR USE BELOW

1- Astoria 2- Exeter 3- Highland 4- Seaside 5- Penncross 6- Kingstown
7- Astra 8- Other Pennlinks 9-Providence 10-Penneagle

1. SPECIES:

1- Colonial (browntop) A. tenuis 2- Creeping A. stolonifera (A. palustris)
3- Velvet A. canina ssp. canina 4- Brown bent A. canina ssp. montana
5- Red top A. gigantea

2. ADAPTATION: (0= Not Tested, 1= Not Adapted, 2= Adapted)

Northeast Southeast North Central Pacific N. W.
 Other (Specify) South West

3. MATURITY (At first anthesis): Use comparison varieties

Days earlier than , Maturity same as , Days later than

4. HEIGHT (Average of longest 10 shoots from soil surface to top of head):

<input type="text" value="4"/> <input type="text" value="5"/> Cm Height (at maturity) Ave	<input type="text" value="1"/> <input type="text" value="0"/> Cm Shorter than <input type="text" value="4"/>	} Comparison Variety
	Height same as <input type="text" value="9"/>	
	<input type="text" value="0"/> <input type="text" value="3"/> Cm Taller than <input type="text" value="8"/>	

5. GROWTH HABIT:

% Prostrate % Decumbent % Geniculate % Erect

Bentgrass - 2 -

6. VEGETATIVE REPRODUCTION:

☒ Rhizomes 1= Absent 2= Present ☒ Stolons 1= Absent 2= Present
☐ % Rhizomes ☒ % short stolons

7. LEAF BLADE:

☒ Color: 1= Yellowish Green (Cohansey) 2= Light Green (Washington)
 3= Green (Exeter) 4= Dark Green (Kingstown, Tracenta)
 5= Bluish Green (Highland) 6= Other (Specify) _____
☒ Texture: (fineness)
 1= Very fine (Kingstown) 2= Fine (Exeter)
 3= Medium fine (Astoria) 4= Medium (Seaside)
 5= Medium coarse (Virginia) 6= Coarse (Vermont)

☐ Stomatal density upper leaf surface (Number/mm²)

Lower Surface: ☐ % Smooth ☐ % Rough

Upper Surface: ☐ % Smooth ☐ % Rough

Margins: ☐ % Smooth ☐ % Rough

☐ Mm Width (Average of 10)

☐ Mm Narrower than ☐

Width same as ☐

☐ Mm Wider than ☐

Comparison

Variety

☒ Mm Width (Flag leaves)

☒ Cm Length (Flag leaves)

8. LEAF SHEATH:

☒ Anthocyanin: 1= Absent 2= Present ☐ % Red sheaths

9. LIGULE (Lower and middle leaves):

Shape at Apex: ☒ Acute ☐ % Rounded ☒ % Truncate

☐ % Other (Specify) _____

Pubescence: ☒ Glabrous ☒ % Pubescent

Margins: ☒ % Entire ☐ % Toothed

☐ % Other (Specify) _____

☐ Mm Length

10. LEMMA:

Shape: ☐☐☐ % Lanceolate ☐☐☐☐ % Ovate ☐☐☐ % Obovate
☐☐☐ % Elliptic ☐☐☐ % Oblong ☐☐☐ % Other (Specify) _____

☐☐☐ Mm Width ☐☐☐ Mm Length (exclusive of awn)

Color: ☐☐☐ % Buff ☐☐☐☐ % Silvery ☐☐☐ % Other (Specify) _____

Surface: ☐☐☐ % Glossy ☐☐☐ % Dull

Texture: ☐☐☐ % Smooth ☐☐☐ % Punctate

Pubescence: ☐☐☐ % Glabrous ☐☐☐ % Sparse ☐☐☐ % Copious

Basal Hairs: ☐☐☐ % Absent ☐☐☐ % Few ☐☐☐ % Many

☐☐☐ % Short ☐☐☐ % Long

☐☐☐ % Appressed ☐☐☐ % Ascending ☐☐☐ % Spreading

Awns: ☐☐☐ % Absent ☐☐☐ % Few ☐☐☐ % Many

☐☐☐ % Awn-pointed ☐☐☐ % Short ☐☐☐ % Long

☐☐☐ % Straight ☐☐☐ % Geniculate

Awn Insertion on Lemma:

☐☐☐ % Basal ☐☐☐ % Middle ☐☐☐ % Distal

11. PANICLE:

Type (in anthesis): ☐☐☐ % Open ☐☐☐ % Compact

Anthocyanin: ☐☐☐ % Absent ☐☐☐ % Present

Branches in Anthesis: ☐☐☐ % Appressed ☐☐☐ % Ascending ☐☐☐ % Spreading

Branches in Fruit: ☐☐☐ % Appressed ☐☐☐ % Ascending ☐☐☐ % Spreading

Branch Surface: ☐☐☐ % Smooth ☐☐☐ % Scabrous

12. SEED:

☐☐☐ Grams per 1000 seed

13. SPRING GREEN UP:

☐ 1= Early (Exeter) 2= Medium (Astoria) 3= Late (Kingstown)

Bentgrass - 4 -

14. ENVIRONMENTAL RESISTANCE: (0= Not tested, 1= Susceptible 2= Resistant)

☒ Cold ☒ Heat ☐ Drought ☐ Shade ☐ Other (Specify) _____

15. DISEASE RESISTANCE (0= Not tested 1= Susceptible 2= Resistant):

☒ Red Leaf Spot - *Drechslera erythrospila* ☐ Helminthosporium Leaf Spot
(*Bipolaris sorokiniana*)
☐ Melting Out - *Drechslera poae* ☒ Dollar Spot - (*Sclerotinia homoeocarpa*)
(*Helminthosporium vagans*)
☒ Pythium Blight - (*P. aphanidermatum*) ☒ Pythium Blight (*P. ultimum*)
☐ Fusarium Blight (*F. roseum*) ☐ Fusarium Blight (*F. tricinctum*)
☒ Fusarium Patch (Pink Snow Mold)
(*F. nivale*) ☐ Powdery Mildew (*Erysiphe graminis*)
☐ Ophiobolus Patch (*O. graminis*) ☐ Stripe Smut (*Ustilago striiformis*)
☒ Copper Spot (*Gloeocercospora sorghi*) ☐ Typhula Blight (Snow Scald)
(*T. incarnata*)
☐ Red Thread (*Corticium fuciforme*) ☒ Brown Patch (*Rhizoctonia solani*)
☐ Stem Rust (*Puccinia graminis*) ☐ Crown Rust (*P. coronata*)
☐ Leaf Rust (*P. poae-nemoralis*) ☐ Other _____

16. INSECT RESISTANCE (0= Not tested, 1= Susceptible, 2= Resistant):

☐ European Chafer ☐ Garden Chafer
(*Amphimallon solstitialis*) (*Phyllopertha horticola*)
☐ Chinch Bug (*Blissus insularis*) ☐ Webworm (*Crambus* spp.)
☐ Armyworm (Cutworm) ☐ Other _____
(*Pseudaletia unipuncta*)

17. GIVE VARIETY(S) THAT MOST CLOSELY RESEMBLE THE SUBMITTED VARIETY: For the following characteristics indicate degree of resemblance (D.R.) with one of the following numbers: 1= Submitted variety is less than, lighter, or inferior to similar variety, 2= Same as, 3= More than, darker or superior, etc.

Character	Similar Variety	D.R.	Character	Similar Variety	D.R.
Growth Habit	Pennlinks	2	Leaf Color	Pennlinks	2
AwN Length			Panicle Type	Pennlinks	2
Seed Weight	Pennlinks	2	Turf Fineness	Pennlinks	3
Cold Resistance	Pennlinks	3	Heat Resistance	Pennlinks	3
Drought Resistance			Shade Resistance		
Brown Patch	Pennlinks	2	Moss Resistance		

18. COMMENTS:

Table 1. Morphological Character Measurements¹ 1995

Plant	Plant Height (cm)	Base Spread (cm)	Panicle Length (cm)	Flag Leaf Length (cm)	Flag Leaf Width (mm)	# Bottom Whorl Branches
Seaside	40.2	Penn G-1	Seaside	5.5	Seaside	5.0
Seaside II	37.8	Penn A-1	Seaside	5.3	Putter	4.7
Penn G-1	36.0	Penn A-4	Cobra	5.2	Regent	4.5
Penncross	34.3	Penn A-2	Seaside II	4.8	Penn A-1	4.5
Penn G-2	34.3	Penn G-2	Penncross	4.8	Southshore	4.5
Penneagle	34.1	Penn G-6	Penneagle	4.7	Procup	4.5
Pennlinks	34.0	Pennlinks	Southshore	4.5	Penn A-4	4.3
Penn A-4	33.7	Cato	Regent	4.5	Penneagle	4.2
Putter	33.2	Crenshaw	Pennlinks	4.5	Lopez	4.2
Southshore	33.1	Providence	Procup	4.4	Cato	4.1
Regent	32.8	Lopez	Putter	4.4	Penn G-1	4.0
SR 1020	32.8	Penneagle	SR 1020	4.4	Penn A-2	4.0
Crenshaw	31.5	Procup	Penn A-4	4.3	SR 1020	4.0
Procup	31.1	Putter	Lopez	4.3	Penneagle	4.0
Lopez	30.7	Regent	Providence	4.3	Seaside II	3.9
Cato	30.3	Southshore	Penn A-1	4.2	Cobra	3.9
Providence	29.8	Cobra	Cato	4.1	Penneagle	3.8
Penn A-1	29.7	SR 1020	Crenshaw	4.1	Penncross	3.8
Penn A-2	29.5	Seaside II	Penn G-2	4.1	Penn G-2	3.7
Penn G-6	28.4	Penncross	Penn G-1	4.0	Providence	3.6
		Seaside	Penn G-6	3.6	Penn G-6	3.6
			Penn A-2	5.7	Procup	1.7
				5.5		
LSD (0.05)	2.1	9.1	0.6	0.5	0.3	0.6

¹Penn State University Breeding Nursery, University Park, PA. Three replications of 25 space plants each.

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Table 2. Morphological Character Measurements¹ 1996

Plant Height (cm)	Panicle Length (cm)	Flag Leaf Length (cm)	Flag Leaf Width (mm)	# Bottom Whorl Branches	
Seaside II	Penn A-1	Penn G-1	Providence	Penn A-1	7.3
Seaside	Seaside	Seaside II	Seaside II	Penn A-2	7.0
Penn A-1	Southshore	Seaside	Lopez	Procup	7.0
Southshore	Crenshaw	Regent	Crenshaw	Crenshaw	6.7
Penn G-2	Cato	Procup	Penn A-1	Lopez	6.6
Crenshaw	Penn G-1	Penn A-1	Cato	Putter	6.4
Providence	Penn G-6	Putter	Procup	Penneagle	6.4
Penn G-1	Seaside II	Penn G-6	Penncross	Pennlinks	6.4
Penn A-2	Penn A-4	Cato	Penn G-6	Penn G-6	6.3
Regent	Penn G-2	Penn A-2	Southshore	Penncross	6.3
Putter	Putter	Crenshaw	Penn G-2	Providence	6.3
Lopez	Pennlinks	Penn G-2	Pennlinks	SR 1020	6.0
Penn A-4	Regent	Lopez	SR 1020	Cato	5.8
Penneagle	Penneagle	Penncross	Penn A-4	Penn G-2	5.6
SR 1020	Procup	Southshore	Putter	Regent	5.6
Procup	Lopez	Penneagle	Penneagle	Penn G-1	5.6
Penn G-6	Providence	SR 1020	Seaside	Southshore	5.5
Penncross	SR 1020	Providence	Penn G-1	Seaside II	5.4
Cato	Penncross	Pennlinks	Penn A-2	Seaside	4.8
Pennlinks	Penn A-2	Penn A-4	Regent	Penn A-4	4.6
LSD (0.05)	5.2	0.67	0.96	0.93	

¹Pure Seed Testing Research Farm, Hubbard, Oregon. Four replications of 25 space plants each.

Table 3. Morphological Character Measurements¹ 1997

Plant Height (cm)	Panicle Length (cm)	Flag Leaf Length (cm)	Flag Leaf Width (mm)	# Bottom Whorl Branches
Seaside	Seaside	7.58	4.50	Penncross 5.18
Penneagle	Pennlinks	7.05	4.27	Penneagle 4.95
Penn G-1	Penneagle	7.00	3.35	Putter 4.95
Seaside II	Crenshaw	6.98	3.30	Penn G-1 4.63
Pennlinks	Providence	6.97	3.23	Seaside II 4.62
Lopez	Seaside II	6.72	3.12	Lopez 4.53
Penn A-4	Southshore	6.68	3.00	Penn A-2 4.50
Penn A-2	SR 1020	6.55	2.95	Providence 4.67
Penn A-1	Regent	6.40	2.93	Southshore 4.42
Penn G-2	Cato	6.04	2.82	Crenshaw 4.37
Southshore	Penncross	5.77	2.82	Pennlinks 4.35
Regent	Penn G-1	5.71	2.73	SR 1020 4.28
Providence	Penn G-2	5.26	2.70	Regent 4.17
SR 1020	Penn A-1	4.87	2.70	Seaside 4.17
Cato	Procup	4.82	2.67	Penn G-2 4.17
Penn A-1	Penn A-4	4.55	2.58	Cato 4.00
Putter	Penn A-2	4.35	2.58	Penn A-4 3.82
Penn G-6	Lopez	4.29	2.45	Penn A-1 3.60
Penncross	Penn A-4	3.97	2.40	Penn G-6 3.45
Procup	Procup	3.83	2.37	Procup 3.43
Crenshaw	Penn G-6	0.75	0.30	
LSD (0.05)	2.9	0.54		0.59

¹Pure Seed Testing Research Farm, Hubbard, Oregon. Second Year Test.

Table 4. Varieties Significantly different from Penn A-4 for Listed Years 1995, 1996, 1997.

Variety	Plant Height		Vegetative Base Spread	Panicle Length		Flag Leaf Length	Flag Leaf Width	# Lower Whorl Branches	Total Years
Penn A-1	95	96		96		96		96	5
Penn A-2	95	96		95	96	96	96	96	8
Penn G-1	95	96			97	96	97	96	7
Penn G-2		96			97			96	4
Penn G-6	95	97		95	97	95	96	96	8
Seaside II	95	96	95	95	97	95	96	97	10
Seaside	95	96	95	95	96	95	96	97	12
Penncross		97	95	95	96	95		97	11
Penneagle		97	95	95	97	97	97	96	8
Pennlinks		96			97			96	3
Putter		97	95		96	96		95	8
Southshore		96	95	95	96	97	97	97	8
Regent			95			96	97	96	7
SR 1020		97	95		96	97	97	96	7
Crenshaw	95	96	95		96	97	95	95	12
ProCup	95	97	95		96	97	95	95	10
Lopez	95		95		96			96	5
Providence	95	96	95		96	97	96	96	10
Cato	95	97	95		97	96	97	97	7
Total Years	31		13	34	27	15	30		

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Additional Description of Penn A-4

In close cut putting green management tests, Penn A-4 has been evaluated as a high quality bent with its density and fine texture. Evaluations are superior to morphologically similar Pennlinks.

It's fine texture (width) compared to most commercial bents is shown in Tables 5 and 6 for multiple states.

Turf quality ratings are among the top in various tests as illustrated in Table 7.

Summer density in both warm and cooler climates is shown in Table 8.

Disease tolerance is moderate for both brown patch and dollar spot (Tables 9 and 10).

Slight accumulation of purple anthocyanin pigmentation under cool temperatures and frost is evident in Table 11.

Table 5. Leaf texture¹ of putting green bent maintained at 4.0 mm as putting green turf in three locations.

University Park, PA		Augusta, GA		Turin, Italy	
	<u>1993</u>	<u>1999</u>		<u>1993</u>	<u>1992</u>
Penn G-2	0.61	0.73	Penn A-2	0.63	Penn G-2 0.63
Penn G-6	0.63	0.73	Penn A-1	0.65	Penn G-6 0.70
Penn A-1	0.63	0.75	Penn G-2	0.65	Penn A-1 0.70
FHG-1	0.63		Penn G-1	0.68	Penn G-1 0.72
Penn G-1	0.65	0.69	Penn A-4	0.69	Seaside II 0.79
Penn A-2	0.67	0.71	Penn G-6	0.71	Pennlinks 0.80
Penn A-4	0.69	0.76	Crenshaw	0.79	SR-1020 0.84
Seaside II	0.74	0.76	Cato	0.80	Southshore 0.85
Pennlinks	0.77	0.93	Seaside II	0.80	Penncross 0.85
Cato	0.80	0.84	Penncross	0.99	Providence 0.86
SR-1020	0.80	0.84			Putter 0.88
Providence	0.81	0.96			Cobra 0.90
Penneagle	0.85	0.95			National 0.90
Putter	0.89				Seaside 0.90
Carmen	0.93				Penneagle 0.95
Cobra	0.95				Emerald 0.96
Penncross	0.99	0.99			
Seaside	1.01	0.99			
Emerald	1.12				
LSD (0.05)	0.04	0.09		0.06	0.10

¹ Leaf width of second sub-tended leaf (mm).

Table 6

LEAF TEXTURE RATINGS OF BENTGRASS CULTIVARS
GROWN ON A GREEN
1994 DATA

NAME	LEAF TEXTURE RATINGS 1-9; 9=VERY FINE 1/											MEAN
	AZ1	IL1	KY1	MN1	MO2	OK1	PA1	RI1	SC1	VA1	WA1	
A-1	7.7	8.7	8.7	7.3	8.0	9.0	8.3	6.0	7.0	7.3	8.3	7.8
A-4	8.3	9.0	8.7	7.7	8.0	8.7	8.3	6.0	6.0	7.3	8.3	7.8
SYN 92-1	8.3	9.0	7.7	7.7	8.0	7.7	8.0	7.0	5.3	8.0	8.0	7.7
G-6	7.3	8.7	8.7	7.3	8.0	9.0	7.7	6.3	5.7	7.3	8.0	7.6
CATO	7.7	9.0	8.7	7.7	6.7	8.3	7.7	6.7	4.7	6.7	7.7	7.4
G-2	7.3	8.7	8.3	7.3	7.7	8.7	6.0	6.0	6.7	6.3	8.0	7.4
SYN 92-5	7.3	8.7	7.7	7.3	8.0	8.0	7.3	6.3	5.0	7.3	8.0	7.4
L-93	7.0	8.3	7.3	7.0	8.0	8.7	7.3	6.7	5.7	6.7	8.0	7.3
CRENSHAW	7.7	8.3	7.3	7.0	8.0	7.3	7.7	6.3	5.7	6.7	8.0	7.3
SYN 92-2	7.3	8.7	7.3	6.3	8.0	8.3	8.0	6.3	4.7	7.3	7.7	7.3
SR 1020	7.0	8.3	7.3	6.7	8.0	8.0	7.0	7.0	5.3	6.7	8.0	7.2
BAR WS 42102	7.3	8.7	7.3	7.3	7.7	8.7	7.3	6.0	4.3	6.3	8.0	7.2
PROVIDENCE	6.3	8.3	7.7	6.7	8.0	8.3	7.7	6.7	4.0	6.3	8.0	7.1
SOUTHSHORE	6.7	8.7	8.0	7.0	7.7	7.7	7.0	6.7	5.0	6.3	7.7	7.1
ISI-AP-89150	5.7	8.0	7.0	7.0	8.0	7.7	7.3	6.7	3.0	6.0	7.7	6.7
18TH GREEN	5.7	8.0	7.0	6.7	7.7	7.3	7.7	5.3	3.7	7.0	7.7	6.7
DG-P	6.0	8.0	7.0	7.0	8.0	8.0	6.0	6.0	4.0	6.0	7.7	6.7
PENNLINKS	5.7	8.0	7.7	7.0	8.0	7.3	5.0	6.3	4.7	5.7	8.0	6.7
MSUEB	5.3	8.0	7.0	6.3	8.0	7.7	6.0	5.3	5.0	5.3	7.7	6.5
REGENT	6.0	8.0	7.0	6.3	8.0	7.3	4.3	7.0	4.3	5.0	7.3	6.4
PRD/CUP	5.3	8.0	7.0	6.3	8.0	7.3	4.0	3.3	3.3	5.3	8.0	6.3
LOPEZ	5.3	8.0	7.7	7.0	8.0	7.0	3.3	5.7	4.0	5.7	8.0	6.3
SYN-1-88	5.7	8.0	6.0	6.0	7.7	7.7	5.0	5.7	5.0	5.7	7.3	6.3
PENNCROSS	5.3	7.7	7.0	6.3	8.0	7.0	3.3	6.0	3.3	5.0	7.7	6.1
TRUELINE	5.0	8.0	6.7	6.7	7.7	7.3	2.7	5.7	3.7	4.7	8.0	6.0
TENDENZ	4.0	8.7	3.7	6.7	7.3	6.7	6.0	6.0	3.0	6.0	7.0	5.9
BAR AS 492	4.0	8.7	3.3	6.7	8.0	6.3	3.0	6.3	2.7	5.7	7.0	5.6
SEASIDE	4.0	7.3	4.3	6.7	7.3	6.0	1.3	7.0	2.7	4.0	7.0	5.2
LSD VALUE	0.8	0.7	1.1	1.0	0.7	0.9	1.1	1.9	1.2	0.9	0.7	0.3

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN. STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

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Table 7

MEAN TURFGRASS QUALITY RATINGS OF BENTGRASS CULTIVARS GROWN ON
A GREEN AT TWENTY-SIX LOCATIONS IN THE U.S.
1994 DATA

TURFGRASS QUALITY RATINGS 1-9; 9=IDEAL TURF 1/

NAME	AZ1	GA1	GA2	IA1	IL1	IL2	KST	KY1	KY2	MA1	M11	MN1	MO1	MO2	NH1	NJ1	OK1	PA1	RI1	SC1	TX1	VA1	WA1	WA3	WI1	WI2	MEAN
A-4	7.2	4.0	2.1	6.7	5.5	7.1	6.9	7.7	7.6	6.1	6.0	7.8	7.3	7.3	6.7	6.0	6.6	6.6	6.1	5.2	7.1	6.6	6.7	6.3	7.4	7.8	6.5
* L-93	6.6	4.3	1.9	6.6	5.3	6.3	6.9	8.0	7.4	7.5	6.3	7.3	6.9	6.9	5.9	7.3	6.4	7.4	6.2	5.1	6.4	6.1	6.2	5.7	7.2	7.3	6.4
* PROVIDENCE	6.2	4.2	2.4	6.5	5.9	6.5	6.9	7.4	7.5	7.3	5.8	6.9	7.6	7.5	7.1	6.2	5.9	6.8	6.0	4.3	7.1	6.0	6.4	5.8	7.3	7.2	6.3
A-1	6.1	3.9	2.2	6.1	5.3	5.7	6.0	8.1	7.4	7.3	5.2	7.4	6.6	7.2	5.2	7.2	6.3	7.3	5.8	5.6	6.7	6.4	6.5	6.2	7.6	7.4	6.3
* CRENSHAW	6.4	3.9	2.3	5.8	5.5	6.7	7.5	7.2	7.4	7.0	5.8	6.9	6.9	7.4	6.2	6.5	6.1	6.1	5.9	5.0	7.1	6.2	6.7	4.9	6.9	7.1	6.2
* CATO	7.3	4.1	2.0	6.6	5.1	5.3	6.7	8.0	6.8	7.4	5.8	7.2	7.0	7.0	6.7	5.7	6.0	6.8	6.5	5.0	6.0	6.1	6.0	6.0	7.1	7.3	6.2
G-6	6.2	4.1	2.2	6.3	4.8	5.5	5.3	7.7	6.8	7.5	5.5	7.5	6.3	7.0	6.4	6.6	6.7	6.5	5.8	5.1	6.3	6.2	6.1	6.0	7.3	7.3	6.1
G-2	6.2	3.9	2.1	5.4	4.9	5.7	5.4	7.8	7.1	6.5	5.8	7.8	6.9	7.2	5.9	6.8	6.1	6.7	6.1	5.1	5.9	6.1	6.5	5.9	7.2	7.5	6.1
* SOUTHSORE	6.0	4.5	1.9	6.2	4.9	6.5	6.6	7.1	6.5	6.1	5.5	7.5	7.1	7.2	6.4	5.9	5.7	6.7	6.2	5.1	6.8	5.8	6.3	5.5	7.2	6.6	6.1
SYN 92-1	6.1	3.9	2.2	5.8	5.1	6.5	7.0	7.1	7.3	6.6	5.2	7.4	7.1	7.3	5.3	5.8	5.9	6.1	5.9	4.4	6.5	6.1	6.1	6.2	7.0	6.8	6.0
SYN 92-5	5.7	3.9	1.9	5.8	5.1	7.1	5.6	7.1	7.3	6.6	5.4	6.5	6.8	7.1	5.1	6.2	5.9	6.3	5.4	4.4	6.5	6.5	6.5	6.4	7.1	7.2	6.0
SYN 92-2	5.7	4.4	2.3	5.3	4.5	7.3	6.5	6.7	7.2	6.0	5.3	7.3	6.9	7.1	5.8	6.0	5.5	5.7	5.7	4.4	6.5	6.3	5.9	5.7	6.8	6.8	5.9
* SR 1020	5.9	4.3	2.4	5.6	4.8	5.7	6.1	7.1	6.8	5.9	5.5	7.1	6.8	7.0	6.4	5.1	5.8	5.8	5.1	4.6	7.2	5.6	6.3	5.5	7.0	6.9	5.9
* PENNLINKS	5.0	4.3	2.5	5.5	5.0	6.4	6.5	7.7	6.5	5.8	5.2	6.8	7.3	7.4	6.0	5.4	5.3	6.2	5.3	4.7	6.1	5.5	6.3	5.2	6.8	7.0	5.8
* REGENT	5.4	4.3	1.8	5.7	4.7	6.0	6.5	7.1	6.7	6.2	5.2	7.0	6.8	7.3	6.2	5.8	5.4	5.6	5.4	4.3	7.2	5.4	6.1	5.2	7.1	6.4	5.8
BAR WS 42102	5.9	3.9	1.7	5.3	4.6	5.5	6.5	7.4	7.2	5.7	5.3	7.4	6.8	7.0	5.9	4.8	5.5	6.8	5.6	3.9	6.0	5.9	6.4	5.5	7.1	7.3	5.8
MSUEB	4.8	4.1	2.2	5.4	4.7	6.7	6.7	7.2	7.2	5.6	5.2	6.6	7.5	7.2	5.3	5.8	5.3	6.3	5.2	5.0	5.7	5.3	6.1	4.7	6.9	6.7	5.7
ISI-AP-89150	5.0	3.9	1.7	5.5	4.8	5.0	5.9	7.3	6.1	6.6	5.2	7.2	7.2	7.2	5.6	5.3	5.3	6.3	5.2	4.0	6.5	5.5	6.5	5.7	7.1	6.5	5.7
* 18TH GREEN	5.4	3.7	1.7	5.2	4.1	4.7	5.5	6.8	7.1	6.3	5.3	7.5	7.1	7.3	7.2	5.2	5.7	5.9	4.9	4.0	6.1	5.9	6.0	4.9	6.5	7.0	5.7
* LOPEZ	4.8	3.9	3.2	5.5	4.3	6.3	5.9	7.7	6.0	6.1	5.2	6.8	7.2	7.1	5.6	5.8	5.1	5.6	5.2	3.4	6.4	5.4	6.1	4.8	6.8	6.7	5.6
* PRO/CUP	5.0	4.1	1.7	4.8	4.5	5.1	6.6	7.3	7.2	5.7	4.8	6.7	6.6	7.1	6.0	5.8	5.3	5.5	5.6	3.6	6.5	5.5	6.1	5.3	6.8	6.6	5.6
DG-P	5.0	3.9	1.8	4.7	4.2	5.7	5.7	7.5	6.0	6.1	5.2	7.0	6.9	7.1	5.8	5.3	5.3	6.2	4.9	3.8	6.5	5.3	5.6	5.2	7.0	6.6	5.6
* PENNCROSS	4.9	4.3	2.7	5.3	4.7	6.1	5.9	7.0	7.3	5.2	5.2	6.8	7.0	7.1	6.2	4.7	4.9	5.3	4.8	3.5	7.0	5.2	6.2	4.8	6.2	6.1	5.5
* TRUELINE	4.8	3.8	2.2	5.2	4.3	4.0	6.4	7.3	6.9	5.5	4.3	7.0	7.4	7.1	6.3	5.9	5.1	5.4	5.6	3.4	6.1	5.4	6.0	4.8	7.1	6.6	5.5
* SYN-1-BB	4.8	4.6	2.0	4.3	4.8	5.1	5.9	7.1	6.7	4.9	4.7	6.8	6.7	7.1	5.0	5.3	5.3	4.5	4.8	3.8	6.5	5.3	6.0	4.5	6.6	6.3	5.4
* SYN-1-88	2.5	3.9	4.4	3.4	3.3	5.3	4.3	5.8	5.1	5.0	4.2	6.5	6.3	6.8	5.9	4.2	3.7	5.1	3.8	3.1	6.1	5.7	5.1	4.4	5.9	5.8	4.8
* TENDENZ	2.4	4.8	5.2	3.6	3.1	4.1	5.6	4.6	4.6	3.8	3.5	6.3	6.0	7.0	2.7	3.6	3.6	4.5	5.0	2.5	5.2	5.1	4.5	4.2	6.8	6.5	4.6
BAR AS 492	3.7	4.3	3.3	3.5	3.9	3.9	4.9	6.3	5.8	3.8	4.0	6.4	6.0	7.0	3.6	3.0	4.0	3.3	4.8	2.8	6.3	3.8	5.1	3.1	5.6	5.6	4.5
* SEASIDE	0.7	0.7	0.7	0.9	0.6	1.8	1.4	0.5	0.6	0.9	0.8	0.8	0.7	0.6	0.4	0.6	0.4	0.7	0.9	0.8	1.2	0.5	0.6	0.4	0.5	0.5	0.2

* COMMERCIALLY AVAILABLE IN THE USA IN 1995.

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN.
STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

Table 8

SUMMER DENSITY RATINGS OF BENTGRASS CULTIVARS
GROWN ON A GREEN
1995 DATA

NAME	DENSITY RATINGS 1-9; 9=MAXIMUM DENSITY 1/										MEAN
	AZ1	GA1	MN1	OK1	PA1	QE1	WA3	WA4			
PENN A-4 (A-4)	9.0	4.3	8.0	9.0	8.7	8.0	8.3	7.7		7.9	
PENN A-1 (A-1)	8.0	4.3	6.7	8.7	8.7	8.0	9.0	8.3		7.7	
CENTURY (SYN 92-1)	8.0	5.0	6.3	8.7	7.7	8.0	8.0	8.3		7.5	
PENN G-6 (G-6)	7.3	4.3	7.3	8.3	8.3	8.0	7.3	8.0		7.4	
PENN G-2 (G-2)	8.3	4.0	6.0	9.0	8.3	7.7	7.3	6.7		7.2	
CATO	7.7	4.3	6.3	8.7	6.3	8.0	8.0	7.3		7.1	
IMPERIAL (SYN 92-5)	7.7	4.7	5.7	7.3	7.0	8.0	8.0	8.3		7.1	
LOFT'S L-93 (L-93)	7.7	4.0	6.3	8.7	7.3	8.0	7.7	6.7		7.0	
SR 1020	7.3	4.3	6.3	8.3	7.0	7.7	7.0	7.0		6.9	
BAR WS 42102	7.3	4.0	7.0	7.7	6.3	8.0	7.0	7.3		6.8	
CRENSHAW	7.3	5.3	5.3	7.7	6.7	8.0	7.0	7.3		6.8	
SYN 92-2	6.7	5.0	6.7	7.3	7.3	7.7	7.0	7.0		6.8	
SOUTHSHORE	7.3	4.3	5.7	7.7	6.3	8.3	7.7	6.7		6.8	
PROVIDENCE	7.3	4.7	5.3	7.0	7.7	7.7	7.0	7.0		6.7	
PENNLINKS	6.0	4.3	5.3	6.7	6.7	8.3	6.7	5.7		6.2	
1ST-AP-89150	6.7	4.0	5.7	7.0	7.3	8.0	5.7	5.0		6.2	
18TH GREEN	6.3	4.0	4.3	7.3	6.3	7.7	6.3	6.3		6.1	
DG-P	5.7	4.0	4.7	6.7	6.7	7.7	6.7	6.0		6.0	
PRO/CUP	6.3	4.3	4.3	7.0	5.3	8.3	6.3	6.0		6.0	
TRUELINE	5.7	4.3	5.3	7.0	5.7	7.7	7.0	5.3		6.0	
MSUEB	6.0	4.7	4.7	7.3	6.3	7.7	6.0	3.7		5.8	
LOPEZ	6.0	4.0	4.7	6.7	5.0	8.0	4.7	6.3		5.7	
PENNCROSS	6.3	5.0	3.7	5.7	5.0	7.7	4.7	6.7		5.6	
MARINER (SYN-1-88)	5.7	4.0	3.7	5.3	6.3	8.0	6.3	5.0		5.5	
REGENT	7.0	4.3	4.7	6.7	5.7	7.3	5.0	3.7		5.5	
BAR AS 492	3.3	6.0	5.0	2.3	3.7	7.0	6.3	4.7		4.8	
TENDENZ	4.0	4.7	-	2.7	4.3	7.3	6.0	3.0		4.6	
SEASIDE	4.0	4.0	3.7	2.3	2.0	8.0	3.7	2.0		3.7	
LSD VALUE	1.1	0.9	1.3	1.2	1.0	1.0	2.0	1.9		0.5	

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN. STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

19700060

Table 9

BROWN PATCH RATINGS OF BENTGRASS CULTIVARS
GROWN ON A GREEN
1994 DATA

NAME	BROWN PATCH RATINGS 1-9; 9=NO DISEASE 1/				
	NJ1	OK1	PA1	SC1	MEAN
MSUEB	8.0	7.3	8.7	8.0	8.0
18TH GREEN	8.7	7.3	8.7	7.3	8.0
G-6	8.7	8.0	9.0	6.0	7.9
A-1	7.7	8.0	8.7	7.0	7.8
CRENSHAW	8.0	7.7	9.0	6.7	7.8
TRUELINE	8.7	7.7	9.0	5.7	7.8
L-93	8.0	7.7	8.7	6.3	7.7
SOUTHSHORE	8.3	6.7	9.0	6.7	7.7
PRO/CUP	8.3	7.7	9.0	5.3	7.6
CATO	7.7	7.7	9.0	5.7	7.5
G-2	8.0	7.3	9.0	5.7	7.5
PROVIDENCE	7.7	8.3	8.7	5.3	7.5
REGENT	8.7	7.3	8.7	5.3	7.5
LOPEZ	8.7	7.0	9.0	5.0	7.4
SR 1020	8.0	7.7	8.7	5.0	7.3
PENNLINKS	8.0	7.0	8.3	5.7	7.3
SYN 92-2	7.3	7.7	8.0	5.7	7.2
SYN 92-5	8.0	8.0	8.7	4.0	7.2
A-4	8.0	7.7	8.3	4.3	7.1
SYN-1-88	8.0	6.3	7.7	5.7	6.9
DG-P	7.3	6.3	8.7	5.3	6.9
SYN 92-1	7.7	8.0	8.3	2.7	6.7
ISI-AP-89150	7.7	6.3	8.0	4.3	6.6
PENNCROSS	8.0	6.7	9.0	2.3	6.5
SEASIDE	5.3	6.7	8.3	5.0	6.3
BAR WS 42102	6.3	6.7	8.7	2.0	5.9
TENDENZ	5.0	5.3	6.0	5.0	5.3
BAR AS 492	4.7	5.3	6.7	3.7	5.1
LSD VALUE	1.3	1.2	1.5	3.1	1.0

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN. STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

HP - 9700060

Table 10

DOLLAR SPOT RATINGS OF BENTGRASS CULTIVARS
GROWN ON A GREEN
1995 DATA

NAME	DOLLAR SPOT RATINGS 1-9; 9=NO DISEASE 1/										MEAN
	KS1	MN1	MO1	NJ1	OK1	PA1	TX1	VA1			
TENDENZ	7.0		8.0	8.3	8.3	9.0	8.0	8.0	8.0	8.1	
BAR AS 492	7.7	7.3	8.3	8.7	8.3	9.0	8.0	6.7	8.0	8.0	
LOFT'S L-93 (L-93)	8.0	7.0	8.0	7.7	8.0	7.7	8.3	7.7	7.8	7.8	
PENN A-1 (A-1)	7.3	8.0	8.0	7.3	8.7	7.7	7.3	6.3	7.6	7.6	
PENNLINKS	8.7	6.7	8.0	7.3	8.3	6.3	7.0	7.3	7.5	7.5	
MSUEB	7.7	6.7	8.3	7.0	8.7	7.3	7.3	6.3	7.4	7.4	
CATO	7.3	6.7	7.7	6.3	8.3	7.7	8.3	7.0	7.4	7.4	
SEASIDE	7.7	7.0	7.7	6.7	8.3	8.0	8.3	5.7	7.4	7.4	
PENNCROSS	8.0	6.0	7.7	7.7	8.7	7.7	6.7	7.0	7.4	7.4	
PROVIDENCE	7.3	7.7	7.0	6.7	7.7	6.7	7.3	7.3	7.2	7.2	
ISI-AP-89150	7.7	7.3	7.0	6.7	8.0	6.7	7.0	6.0	7.0	7.0	
DG-P	7.3	6.0	7.7	6.7	8.3	6.3	7.7	6.0	7.0	7.0	
REGENT	7.3	6.3	6.3	6.0	8.3	7.0	8.3	6.0	7.0	7.0	
BAR WS 42102	6.0	7.0	7.0	6.3	8.3	8.0	7.0	6.0	7.0	7.0	
LOPEZ	6.7	7.3	6.7	5.7	8.3	6.7	7.3	5.7	6.8	6.8	
PENN G-2 (G-2)	6.7	7.7	6.0	6.3	8.3	7.3	7.3	4.7	6.8	6.8	
PENN G-6 (G-6)	6.7	6.3	6.7	6.3	8.3	6.7	7.0	6.0	6.8	6.8	
SOUTHSHORE	6.0	5.3	6.7	5.7	8.0	6.7	8.0	7.0	6.7	6.7	
TRUELINE	6.3	7.0	5.3	6.0	8.0	6.3	7.7	6.3	6.6	6.6	
PENN A-4 (A-4)	5.3	6.3	7.3	5.7	8.3	6.3	7.3	5.3	6.5	6.5	
PRO/CUP	7.0	5.7	6.3	5.7	8.0	6.3	7.0	4.7	6.3	6.3	
MARINER (SYN-1-88)	6.3	7.3	5.0	5.7	8.0	5.3	7.7	5.0	6.3	6.3	
IMPERIAL (SYN 92-5)	5.0	7.3	6.3	4.0	7.7	5.7	7.3	4.7	6.0	6.0	
SR 1020	4.7	6.3	6.3	4.7	7.3	5.3	7.3	4.0	5.8	5.8	
SYN 92-2	5.3	4.7	6.3	3.0	7.3	5.3	6.0	4.3	5.3	5.3	
CENTURY (SYN 92-1)	3.7	5.0	4.3	3.3	6.7	3.7	7.3	3.3	4.7	4.7	
18TH GREEN	5.0	3.7	4.0	3.3	6.3	2.7	7.3	4.3	4.6	4.6	
CRENSHAW	4.0	4.7	5.0	2.3	6.7	3.7	6.7	3.3	4.5	4.5	
LSD VALUE	1.3	2.0	1.6	1.2	1.1	1.2	1.5	1.4	0.5	0.5	

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN. STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

9700060

Table 11. Winter purple color ratings. Augusta National Golf Club, Georgia, 1993-1994.

	Average % Winter Purple Color		
	1993	1994	Ave
Penn A-1	12	3	7.5
Penn A-4	6	10	8.0
Penn G-2	3	15	9.0
Penn G-1	15	5	10.0
Penn A-2	2	20	11.0
Seaside II	10	40	25.0
Penncross	25	30	27.5
Cato	30	40	35.0
Penn G-6	40	50	45.0
Crenshaw	60	50	55.0
LSD (0.05)	9.2	12.5	10.2

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY DIVISION - PLANT VARIETY PROTECTION OFFICE

EXHIBIT E
STATEMENT OF THE BASIS OF OWNERSHIP

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S)

Pennsylvania Agricultural Experiment Station

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER

A-4

3. VARIETY NAME

Penn A-4
Creeping Bentgrass

4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)

Charles R. Krueger Bruce McPheron
Associate Dean
0217 Agricultural Admin. Bldg.
University Park, PA 16802

5. TELEPHONE (include area code)

814-865-5410

6. FAX (include area code)

814-863-7905

7. PVPO NUMBER

9700060

8. Does the applicant own all rights to the variety? Mark an "X" in appropriate block. If no, please explain.

☒ YES ☐ NO

9. Is the applicant (individual or company) a U.S. national or U.S. based company? If no, give name of country

☒ YES ☐ NO

10. Is the applicant the original breeder? If no, please answer the following:

☐ YES ☒ NO

a. If original rights to variety were owned by individual(s):

Is (are) the original breeder(s) a U.S. national(s)? If no, give name of country

b. If original rights to variety were owned by a company:

Is the original breeder(s) U.S. based company? If no, give name of country

☒ YES ☐ NO

11. Additional explanation on ownership (If needed, use reverse for extra space):

J. M. Duich, Professor Turfgrass Science is breeder.
Employee of applicant with rights assigned to applicant.

PLEASE NOTE:

Plant variety protection can be afforded only to owners (not licensees) who meet one of the following criteria:

- If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
- If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.
- If the applicant is an owner who is not the original breeder, both the original breeder and the applicant must meet one of the above criteria.

The original breeder may be the individual or company who directed final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definition.

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